



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 24, 2024 – 12:04 am GMT

PDB ID : 8R7F
Title : Transcription factor BARHL2 homodimer with spacing two bp
Authors : Morgunova, E.; Popov, A.; Yin, Y.; Taipale, J.
Deposited on : 2023-11-24
Resolution : 1.98 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.40

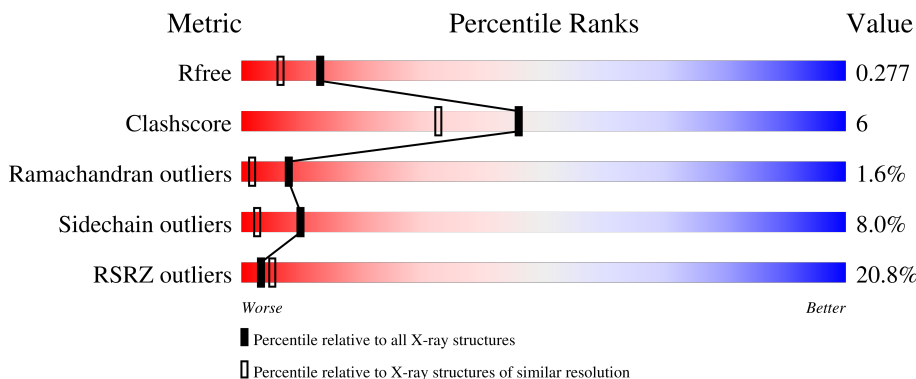
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.98 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	1356 (1.98-1.98)
Clashscore	180529	1437 (1.98-1.98)
Ramachandran outliers	177936	1426 (1.98-1.98)
Sidechain outliers	177891	1426 (1.98-1.98)
RSRZ outliers	164620	1356 (1.98-1.98)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	B	16	
2	D	16	
3	A	64	
4	E	63	

2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 1735 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a DNA chain called DNA (5'-D(*CP*TP*AP*AP*AP*CP*GP*GP*GP*CP*AP*AP*TP*TP*AP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	B	16	328	157	65	91	15	0	0	0

- Molecule 2 is a DNA chain called DNA (5'-D(*CP*TP*AP*AP*TP*TP*GP*CP*CP*CP*GP*TP*TP*TP*AP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	D	16	322	156	54	97	15	0	0	0

- Molecule 3 is a protein called BarH-like 2 homeobox protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	A	64	537	332	107	97	1	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	231	ALA	-	expression tag	UNP Q9NY43

- Molecule 4 is a protein called BarH-like 2 homeobox protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	E	63	539	334	108	96	1	0	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	2	Total O 2 2	0	0
5	D	2	Total O 2 2	0	0
5	A	3	Total O 3 3	0	0
5	E	2	Total O 2 2	0	0

3 Residue-property plots [i](#)

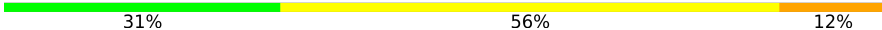
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

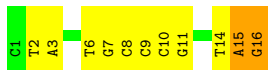
- Molecule 1: DNA (5'-D(*CP*TP*AP*AP*AP*CP*GP*GP*GP*CP*AP*AP*TP*TP*AP*G)-3')

Chain B:  62% 38%



- Molecule 2: DNA (5'-D(*CP*TP*AP*AP*TP*TP*GP*CP*CP*CP*GP*TP*TP*TP*AP*G)-3')

Chain D:  31% 56% 12%




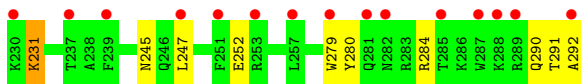
- Molecule 3: BarH-like 2 homeobox protein

Chain A:  28% 72% 22% 6%



- Molecule 4: BarH-like 2 homeobox protein

Chain E:  24% 84% 14%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	45.34Å 63.17Å 51.32Å 90.00° 111.72° 90.00°	Depositor
Resolution (Å)	47.68 – 1.98 47.68 – 1.98	Depositor EDS
% Data completeness (in resolution range)	97.5 (47.68-1.98) 97.5 (47.68-1.98)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.00 (at 1.98Å)	Xtrriage
Refinement program	REFMAC 5.8.0419	Depositor
R, R_{free}	0.233 , 0.273 0.239 , 0.277	Depositor DCC
R_{free} test set	922 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	51.5	Xtrriage
Anisotropy	0.391	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 45.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	1735	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.04% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality i

5.1 Standard geometry i

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	B	0.76	0/369	1.77	11/568 (1.9%)
2	D	0.84	0/359	1.73	8/552 (1.4%)
3	A	0.41	0/546	1.05	1/734 (0.1%)
4	E	0.41	0/548	1.03	2/734 (0.3%)
All	All	0.60	0/1822	1.39	22/2588 (0.9%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
3	A	0	1

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	3	DA	O5'-P-OP1	13.38	126.75	110.70
2	D	2	DT	O3'-P-O5'	-11.59	81.98	104.00
1	B	2	DT	O3'-P-O5'	-11.36	82.42	104.00
2	D	7	DG	OP1-P-O3'	-8.46	86.58	105.20
2	D	16	DG	O4'-C1'-N9	-8.03	102.38	108.00
2	D	3	DA	O5'-P-OP2	7.49	119.68	110.70
1	B	15	DA	O3'-P-O5'	-7.34	90.05	104.00
1	B	2	DT	OP1-P-O3'	6.67	119.86	105.20
1	B	3	DA	O4'-C1'-N9	-6.33	103.57	108.00
1	B	7	DG	OP2-P-O3'	6.12	118.66	105.20
2	D	15	DA	O4'-C1'-N9	6.11	112.27	108.00
2	D	11	DG	C8-N9-C1'	5.93	134.71	127.00
2	D	11	DG	C4-N9-C1'	-5.73	119.05	126.50
1	B	7	DG	OP1-P-O3'	-5.36	93.41	105.20

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	14	DT	O5'-P-OP2	5.25	117.00	110.70
1	B	15	DA	C1'-O4'-C4'	-5.24	104.86	110.10
1	B	3	DA	OP1-P-O3'	5.20	116.64	105.20
4	E	245	ASN	CB-CA-C	5.18	120.77	110.40
4	E	284	ARG	NE-CZ-NH2	-5.18	117.71	120.30
1	B	12	DA	OP2-P-O3'	5.05	116.31	105.20
1	B	13	DT	O5'-P-OP1	5.04	116.75	110.70
3	A	257	LEU	CB-CG-CD2	5.02	119.53	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	A	233	ARG	Sidechain

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	328	0	181	0	0
2	D	322	0	184	5	0
3	A	537	0	537	9	0
4	E	539	0	546	4	0
5	A	3	0	0	0	0
5	B	2	0	0	0	0
5	D	2	0	0	0	0
5	E	2	0	0	0	0
All	All	1735	0	1448	16	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

All (16) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:231:ALA:HB1	3:A:232:PRO:CD	2.21	0.70

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:231:ALA:HB1	3:A:232:PRO:HD2	1.74	0.70
2:D:10:DC:OP1	3:A:256:TYR:OH	2.15	0.62
3:A:263:MET:HG2	3:A:273:ASP:OD1	2.02	0.59
3:A:290:GLN:O	3:A:293:VAL:HG12	2.07	0.54
4:E:291:THR:O	4:E:292:ALA:C	2.49	0.50
2:D:15:DA:C2	2:D:16:DG:C6	3.02	0.46
2:D:6:DT:OP1	4:E:231:LYS:HE2	2.16	0.46
3:A:257:LEU:HD13	3:A:262:ARG:HA	1.98	0.46
3:A:231:ALA:CB	3:A:232:PRO:CD	2.92	0.45
2:D:9:DC:H2''	2:D:10:DC:C5'	2.47	0.44
4:E:247:LEU:HD13	4:E:279:TRP:CD1	2.54	0.43
4:E:247:LEU:HD13	4:E:279:TRP:CG	2.54	0.43
3:A:247:LEU:HB3	3:A:279:TRP:CZ3	2.55	0.41
2:D:8:DC:H2''	2:D:9:DC:O5'	2.21	0.41
3:A:266:ALA:HB1	3:A:271:LEU:O	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	A	62/64 (97%)	60 (97%)	0	2 (3%)	3	0
4	E	61/63 (97%)	61 (100%)	0	0	100	100
All	All	123/127 (97%)	121 (98%)	0	2 (2%)	8	2

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	232	PRO
3	A	233	ARG

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
3	A	56/56 (100%)	51 (91%)	5 (9%)	8 2
4	E	57/57 (100%)	53 (93%)	4 (7%)	12 4
All	All	113/113 (100%)	104 (92%)	9 (8%)	10 2

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	234	LYS
3	A	273	ASP
3	A	277	LYS
3	A	280	TYR
3	A	285	THR
4	E	231	LYS
4	E	252	GLU
4	E	280	TYR
4	E	290	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	245	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2		OWAB(Å ²)	Q<0.9	
1	B	16/16 (100%)	-0.24	0	100	100	61, 68, 77, 79	0
2	D	16/16 (100%)	-0.24	0	100	100	51, 69, 81, 85	0
3	A	64/64 (100%)	1.50	18 (28%)	2	2	50, 68, 137, 189	0
4	E	63/63 (100%)	1.31	15 (23%)	2	4	52, 69, 107, 125	0
All	All	159/159 (100%)	1.07	33 (20%)	3	5	50, 69, 113, 189	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	A	292	ALA	5.6
3	A	239	PHE	4.7
3	A	293	VAL	4.3
3	A	281	GLN	4.3
3	A	291	THR	4.1
4	E	251	PHE	4.1
3	A	279	TRP	4.0
3	A	256	TYR	3.8
3	A	231	ALA	3.8
4	E	292	ALA	3.7
4	E	281	GLN	3.7
4	E	230	LYS	3.7
3	A	280	TYR	3.6
4	E	285	THR	3.5
3	A	278	THR	3.5
3	A	285	THR	3.3
3	A	251	PHE	3.1
3	A	282	ASN	3.1
4	E	237	THR	3.1
3	A	244	LEU	3.1
3	A	294	GLY	3.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
4	E	239	PHE	2.9
4	E	247	LEU	2.7
3	A	232	PRO	2.7
4	E	289	ARG	2.6
4	E	282	ASN	2.6
3	A	262	ARG	2.4
3	A	238	ALA	2.4
4	E	288	LYS	2.4
4	E	287	TRP	2.3
4	E	253	ARG	2.1
4	E	257	LEU	2.1
4	E	279	TRP	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.